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the former the exhibition of brilliant colour is primarily a sexual attraction, being better developed in the male than it is in the female; but it seems probable that even in *Liolepis* any excitement may cause a display, and that in a secondary manner this display has come to be used as a means of alarming enemies, though it will be noticed that the conspicuous stripes are not exhibited suddenly, or immediately on disturbance, but only when the animal is handled. Also it is strange if the larger, more active male has this means of defence better developed than the female, which must be much less agile at times. The fact that *Liolepis bellii* has particularly strong teeth and jaws does not seem to me to be of any importance in considering the case. The Cobra affords one of the best instances of alarming coloration and attitude, and it happens to be a particularly venomous animal; but there are instances of similar display among animals which have no such dangerous qualities.

The black-and-yellow Snake, *Dipsadomorphus dendrophilus*, which is the commonest large Snake in Lower Siam, when driven to extremities exhibits movements which may be compared with the sudden display of colour by other forms. If a specimen of this Snake is tied up so that it cannot escape, it raises its head, gapes, hisses, strikes wildly at anything that is held near it, and drums spasmodically upon the ground with the last few joints of its tail, thus producing a curious noise. But I have never seen it bite, even when a stick was held close to its mouth; though many Snakes, e. g. *Coluber taniurus*, will snap at anything, even at their own bodies, when they are sufficiently enraged. The Malays say that *Dipsadomorphus* is not poisonous; but they are much afraid of its bite, because of its violent appearance.

V. SOUNDS PRODUCED BY INSECTS.

A Cicada (*Dundubia intemerata*).

There are two distinct colour varieties of this species, found together and independent of sex; the body of one being grass-green, and that of the other pale brown, which becomes yellow as the insect dries. Among my dried specimens there are intermediate forms more or less mottled; but this peculiarity did not appear for some days after death, and in life all the individuals were either one colour or the other.

At certain seasons this Cicada forms a regular article of diet among the Siamese inhabitants of Patalung; and as their method of capturing it is based upon a knowledge of its habits, I cannot do better than give an account of this method, as I saw in operation at Ban Nah, a village on the border of the hill-country of Patalung. Immediately after the sun had set several of the natives gathered in an open space, round a fire of brushwood or a number of torches fastened to stakes stuck into the ground, and commenced to clap their hands in unison, observing a regular time and rhythm. Very soon, if they were fortunate, the Cicadæ flew

out from the undergrowth of the surrounding orchards and jungle, and alighted on the persons of their captors, who had no difficulty in picking off the insects with their fingers and securing them, still alive, in a fold of their draperies. The clapping only continued for about half an hour every evening, and when, with considerable difficulty, I persuaded the men to recommence it again later in the night, not a single Cicada came near them, though the stridulating had now become loud all over the village, like the noise of machine hair-brushes in a barber's shop.

The insects were silent on the wing, and I only heard one stridulate when caught. The voiceless females, as might be expected, were in great preponderance over the males among the specimens taken; probably the one individual which was not dumb when captured was the only male taken that night. In order to be sure that the fire was not the chief attraction for the Cicadæ, I stood among a party of natives who were clapping, together with another member of the Expedition, who clapped also; while I kept my hands still. In the course of a few minutes, the natives captured many specimens, and ten alighted on my friend's coat; but only one settled on mine. Afterwards I heard from a Patani Malay that the children of Patani town have a game in which they attract Cicadas by clapping their hands, and without the aid of light at all; though they sing, as they clap, a nursery rhyme, calling upon the insects to come down from the trees. The season of the edible Cicada seems to be a very local one in Patalung. At Ban Nah on the 1st of April, and again on the 6th of the same month, the natives secured me as many specimens as I wanted, besides serving a dish of them with our curry on the second occasion. On April 3rd, at Ban Kong Rah, which is only about eight miles further inland than Ban Nah, our guard of native military police were unable to catch a single individual, although they adopted exactly the same method of procedure as the Ban Nah people had done, and clapped at the same time of evening. On none of these three occasions had the moon risen, and in Patalung one night is like another in the dry season. On April 5th, I noticed that the ground in a patch of primæval jungle near Ban Kong Rah was covered with the cast pupal skins of a Cicada. Whether they were those of the edible species or not, I am unable to say with certainty, but they were of the correct size, and, so far as I could see, such as might be expected to belong to this form.

Malay Name, etc.—The Malay-speaking Malays of lower Siam call a Cicada "*Riang-riang*," confusing it with certain large Melolonthid beetles belonging to at least four different species—*Lepidiota stigma*, another species of the same genus, and two species of *Leucopholis*—which buzz round the tops of the cocoanut-palms in the evening, and produce, probably in the same way as the common Cockchafer¹, a sound with a considerable resemblance

¹ See Lubbock, 'The Senses of Animals,' p. 67.

to the word "*riang*" (to call back) pronounced very rapidly and repeatedly. All four species of beetle are on sale for food in the local markets of Patalung, and their grubs, which are found in the earth or under fallen trees, are eaten also. (A conventional representation of the grubs is often carved on rice-stirrers and other objects of household use by the Malays, who call them "*Ulat Kiki*.") Both beetles and Cicadæ are either boiled or fried in cocoanut-oil. The latter have very little flavour of any sort, and what they have is vegetable rather than animal.

Remarks.—The existence of auditory organs in the Cicadæ has not been demonstrated with certainty. The insects must indeed be deaf if they mistake the sound of clapping for the squeaky whirr of the male's stridulation. It is evident, however, that the females have some perception of rhythm, if not of sound. May not this perception be due to vibrations produced in the opercula of the stridulating apparatus? The opercula are often well developed in the voiceless females, though they differ in shape from those of the males. The males, supposing that the perceptive organ were situated in the stridulating apparatus, would be deafened by their own song; as Sharp points out when dealing with Swinton's theory that one of the membranes of the apparatus itself, a membrane which apparently is only present in the male, is an auditory organ. But there is no need for the males to hear their own song, and no proof that they do so. Though only one species of Cicada is attracted by the particular rhythm with which the people of Patalung clap their hands, another rhythm might attract another form. The several species of Cicadæ inhabiting the same country undoubtedly sing in different rhythm¹ from one another. The song of this species is fairly monotonous and unbroken, though it rises and falls to a slight extent. That of the large form *Pomponia imperatoria*, which restricts itself to deep jungle, rises in a series of trills, each of which concludes with a kind of click. Each section of the song is faster, louder, and clearer than the one which preceded it; until, about five minutes after the Cicada's settling, the noise suddenly comes to an end, as the insect flies off to another tree, where it commences again. The sound produced by this species is, at the beginning of the song, like the winding-up of a large clock, and ends by being comparable to the notes of a penny whistle. Another insect, commonly heard at night in the jungle, presumably also a Cicada, has a clear, loud, clarion-like call which can be heard for a great distance.

The sounds in a Malayan jungle after dark may justly be compared to those in the machinery-hall of an exhibition at the busiest time of day, and their volume increases materially before the coming of dawn. The body of the din is the work of small Cicadæ, like the edible species, but the true *riang-riang* and certain Locustids have no mean share in its production. In some places the "Singing

¹ See Riley, Proc. Amer. Assoc. Adv. Science, vol. xxiv. p. 331.

Earthworm"¹, a Gryllotalpid cricket, contributes from its hole in the ground a deep, organ-like note. What is the meaning of all this noise? "The *riang-riang* sing," a Malay would say, "because their livers are glad"; and in many cases we are not in a position to give any better reason. The stridulation of the male Cicada appears to be in the main and primarily a sexual call, but may also be used as a warning or alarming cry.

Of insects capable of producing a sound, some species stridulate when captured, but all do not. The brilliantly coloured little black and scarlet *Huechys sanguinea*, which, unlike the majority of Malayan Cicadæ, is diurnal and flies about among bushes in the open at midday, is silent when handled. The male of the large dung-beetle *Heliocopris mouhotus*, a pair of which was brought to me at Biserat by an elephant mahout, squeaks like a bat when touched, but is silent when lifted from the ground. The female of this species is dumb. On the other hand, many kinds of Orthoptera only stridulate when they are left in peace and quiet. In the Malay Peninsula the majority of stridulating species are nocturnal, or only sing at sunset and just before sunrise. There one does not hear the noise of grasshoppers among long grass at midday as one does in this country, though in the jungle there is a subdued hum of insects continually. At Belimbing in Legeh a man brought me several specimens of the "*Belalang Rusa Ijou*" or Green Deer Grasshopper (*Mecopoda elongata*). Each specimen was in a small bamboo-cage, as he said that if two were put together they would fight. He told me that children kept this grasshopper as a pet, feeding it on the young shoots of the pineapple, in order that they might hear it "crow." My specimens were silent all day, and all the evening while the lamp was lit; but in the middle of the night we were awakened by their stridulations.

VI. INSECT LUMINOSITY.

An Aquatic Lampyrid Larva.

Form and Colour.—The body is elongated and narrow: the head is minute, and can be retracted within the thorax. There are eight abdominal segments, which are little differentiated from those of the thorax superficially. The upper surface is corrugated. The colour is dark brown, minutely marked with dull yellow in some specimens. The luminous organs were situated in two small oval patches on the under surface of the last abdominal segment, just behind the anus.

Habits.—On March 30th, when catching fire-flies by the side of a marsh at Lampam, the chief town of Patalung, I noticed a number of luminous points on the surface of a small stagnant pool. We had some difficulty in ascertaining the origin of these, for they died away slowly when the water was disturbed; and it was not until we examined some of the plants floating on the top of the

¹ See 'Oxford Magazine,' Oct. 17th, 1900, p. 9.